

CLAIMS:

1. A method for producing a family of discretely and uniformly sized elemental silicon nanoparticles, the family including a plurality of discretely and uniformly sized nanoparticles selected from the group of 1, 1.67, 2.15, 2.9, and 3.7 nanometer nanoparticles, the method comprising steps of:
- 5 gradually advancing a silicon anode into an HF acid H_2O_2 etchant solution;
- creating a moderate to low electrical current density to the silicon anode as it is gradually advanced and to a cathode in electrical contact with the etchant solution;
- 10 separating the silicon anode from the etchant solution; and immersing the anode in dilute HF to weaken linkages of nanoparticles other than 1nm nanoparticles formed on the anode;
- separating the family of discretely sized silicon nanoparticles from the silicon anode.
- 15 2. The method according to claim 1, wherein said step of separating the family of discretely sized silicon nanoparticles comprises:
- subjecting the silicon anode to force to separate silicon nanoparticles from the silicon anode.
3. The method according to claim 2, wherein the force in said
- 20 step of subjecting is provided by ultrasound waves.
4. The method according to claim 1, wherein said step of separating the family of discretely sized silicon nanoparticles comprises:
- placing the silicon anode in a solvent and subjecting the silicon anode to force to separate silicon nanoparticles from the silicon anode.
- 25 5. The method according to claim 1, wherein said step of gradually advancing immerses the silicon anode at a rate of about one millimeter per hour.

Sub 31

6. The method according to claim 1, wherein the cathode is formed from platinum, the silicon anode comprises a single crystalline silicon wafer, and the etchant solution comprises HF acid, H₂O₂ and methanol.
7. The method according to claim 6, wherein the silicon wafer comprises p-type boron-doped silicon.
8. The method according to claim 1, further comprising steps for isolating a desired size of silicon nanoparticles from the family, the steps for isolating comprising:
- with a colloid of the family of particles obtained after said step of separating, centrifuging the colloid of the family of particles; and obtaining a residue of silicon nanoparticles from the step of centrifuging, and a solution; obtaining a desired size of nanoparticle from one of the residue and solution.
9. The method according to claim 8, the steps for isolating further comprising chromatography to further isolated a desired size of nanoparticle.
10. The method according to claim 1, wherein the moderate to low current density within a range of about 5-10 mA/cm².
11. The method according to claim 1, wherein the moderate or low current density is less than about 10 mA/cm².
12. The method according to claim 1, further comprising a 1nm nanoparticle separation step, conducted prior to said step of immersing the anode.
13. Elemental silicon formed into a family of discretely and uniformly sized elemental silicon nanoparticles, the family including 1, 1.67, 2.15, 2.9, and 3.7 nanometer nanoparticles.